

# CODING ALGORITHM TRACKS DOWNED POWER LINES

During an ice storm, earthquake, or flood, utilities personnel are often left in the dark about which power lines are down. They must wait for customers to call to locate the problem. Such spotty information slows customer service—more important than ever as utilities become increasingly competitive.

The University of Rochester (Rochester, NY) is developing an alarm system that automatically signals a power company whenever a line breaks or fails. In a \$300,000 contract with Rochester Gas and Electric Corporation (RG&E), university engineers are building tiny transmitters-on-a-chip that detect power outages by using a BMDO congruential coding technology. BMDO originally funded the technology to increase the number of channels in multiuser radar and spread-spectrum communications.

**T**HE UNIVERSITY OF ROCHESTER IS APPLYING BMDO-FUNDED R&D TO A DEVICE THAT CAN DETECT AND LOCATE POWER LINE FAILURES FOR ROCHESTER GAS AND ELECTRIC.

With the University of Rochester's coding technology, penny-sized transmitters could be built into porcelain insulators that sit on power lines. These transmitters can detect line and equipment failures and then transmit this information to the emergency center of a power distribution network, even in bad weather. With traditional technologies, it is difficult to transmit many signals or dis-

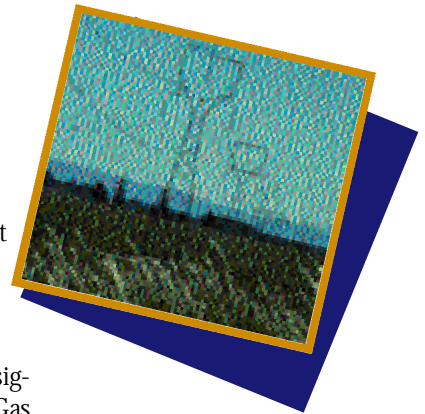
criminate among simultaneously transmitted signals in adverse conditions. By using this coding technology, personnel at RG&E can locate line and equipment failures more accurately within the utility's service territory—without waiting for customers to call. Then they can quickly repair the lines, restoring power and protecting unsuspecting pedestrians from potentially fatal shocks and burns caused by downed power lines.

The University of Rochester also developed the coding technology to detect and classify submarines allowing a torpedo to distinguish between its sonar signal and stray signals, and lock onto its target. The coding technology could provide for even more users in a code division multiple access cellular telephone system than current coding techniques. It could also be used for computer networking systems, sonar, radar, and satellite communications.

## ABOUT THE TECHNOLOGY

Each power line could be outfitted with a transmitter that periodically sends a low-power, coded electrical pulse back into the power grid. Potentially, thousands of signals could be sent back to the utility, but electronic noise within the power lines makes it difficult to find these signals. By recognizing each signal's digital address, or unique code, the coding algorithm can pick signals out of electronic noise and link them with particular transmitters, no matter how many signals are transmitted in the same frequency band. This ability allows a computer at the utility's emergency center to track the codes and, if one vanishes, sound an alert that a line may be down.

Early tests of the alarm system have been successful. Signals sent from transmitters placed on lines at researcher's homes could be detected miles away in their university offices, just by plugging the receiver into a standard wall outlet. More extensive testing will follow if the researchers can bring the cost down from about \$500 per unit to well under \$200. University researchers are also investigating techniques to simultaneously transmit other types of data signals through existing power lines.



Using the University of Rochester's coding technology, electric utilities can locate their line and equipment failures more accurately so that power can be quickly restored.